

Dr. Robert B. Chatfield

Atmospheric Chemistry and Dynamics Branch,

NASA/Ames Research Center, M.S. 245-5, Moffett Field, California, USA

Robert.B.Chatfield@nasa.gov; 650-604-5490

650-604-5490; FAX: 650-604-3625; <http://geo.arc.nasa.gov/sgg/chatfield/> <http://www.sonic.net/~chat>

Research Expertise

Atmospheric Chemistry and Transport: analysis, simulation, and context

- Simulation and statistical analysis of trace gases and aerosols, with a view encompassing planetary environmental and biogeochemical relevance.
- Close examination and critique of models using observational evidence.
- Ozone, carbon monoxide, basic atmospheric N, S, and X chemistry, biomass burning.
- Conceptual advances in boundary layer and free tropospheric transport as they interact with chemical transformation; numerical parameterization of processes controlling transformation from surface through regional to the intercontinental scale.
- Special emphasis on tropical and subtropical processes.
- Application and validation of satellite data for ozone, carbon monoxide, aerosols.

Education

Colorado State University	Ph.D.	1982	Atmospheric Science
University of Washington	M.S.	1976	Atmospheric Sciences
Rice University	B.A.	1969	Math (Chemical Physics)

Dissertation: *Remote tropospheric SO₂: Cloud transport of reactive sulfur emissions*, with Paul J. Crutzen, Nobel Prize winner, at the Max-Planck -Institut für Chemie

Professional Experience

NASA Ames Research Center (1990-1999) Researcher, Atmospheric Chemist

- Leader of a small research group. Focus: the study of source, chemical, and transport processes where they clearly require improvement in global simulations. Basic technique: reconcile detailed, situation-specific studies of emissions and observed chemical composition (from aircraft and satellites), and deposition, and so to check the closure of chemical and particulate budgets. We use NASA's Finite Volume General Circulation Model and our own flexible, 0-,1-,2-, or 3-dimensional models for synoptic-to-global transport and transformation for idealized *or* highly experiment-

specific analyses. We are collaborating with other centers including Goddard Space Flight Center, University of São Paulo, University of Virginia, University of North Carolina, Harvard, and others. Strong connections with those studying land use, biomass burning, surface deposition of trace species, and gaseous emissions from soils, plants, and combustion, as they compose the great global biogeochemical cycles.

National Center for Atmospheric Research, Atmospheric Chemistry Division

– Postdoctoral fellow and Research Scientist, 1984–1990; work on transport parameterizations, modeling of oxidant chemistry, and field observations.

Research Assistant, Associate, and Lecturer, the Colorado State University, wrote and published the Zimmerman et al. (1978) publication stressing the large chemical effect of isoprene on the environment. Taught introductory graduate-level atmospheric thermodynamics on short notice.

Washington State University, College of Engineering, Junior Meteorologist, 1976–1977–analytic, statistical, and simulation work on biogenic emissions of isoprene, ethylene, and regional pollutant organics in the rural Midwest, with Rei Rasmussen, Pat Zimmerman, and others. A mind-expanding short job.

University of Washington, 1972–1975, Atmospheric Sciences, Research Assistant and Teaching Assistant. Considerable teaching experience in interpreting introductory undergraduate meteorology.

United States Peace Corps, Malaysia, 1969–1971. High school science teacher, Raub, Pahang. Used meteorological ideas to make physics relevant. Initial interest in tropical meteorology.

Honors, Science Teams, Scientific Societies

- *Annual Invited Lecturer* at U.C. Berkeley.
- *Science Teams*: NASA Global Modeling Initiative, Global Tropospheric Experiment
- *NASA Professional Development Program at NASA Headquarters, 2000–2001.*
- *American Geophysical Union, American Meteorological Society*
- *Assistant Editor, Atmospheric Environment, 1992–2000.*

Recent Presentations

International Union of Geodesy and Geophysics, “Lightning And Other Influences on Tropical Empirical Studies of Covariation and Mechanism.” Sapporo, Japan, July 7, 2003.

Goddard Space Flight Center, “Mechanisms of Intraseasonal Variation of Tropospheric Ozone: Field/Forest Burning, Lightning, and South Asian (read: INDOEX ?) Influences,” August 14, 2003

Aura Satellite Science Team Meeting, Pasadena, CA: "Convective Lofting Links Indian Ocean Air Pollution to Paradoxical South Atlantic Ozone Maxima; Challenges of TOMS Tropospheric O₃ Interpretation for Daily Mapping," October 1, 2003

Berkeley Symposium

American Geophysical Union, Fall Meeting: "Convective Lofting Links Indian Ocean Air Pollution to "Paradoxical" South Atlantic Ozone Maxima, December 5, 2003

University of Kwazulu-Natal: "The Photochemistry of Ozone" and "Pollution Plume Transport of Ozone 1,000 to 10,000 km" January 26 and 28, 2004

University of Witwatersrand, "A Central Role for South and Central Africa in Global Pollutant Transport" January 30, 2004.

Publications

Chatfield, R.B., H. Guan, A.M. Thompson, J.C. Witte, Convective lofting links indian ocean air pollution to paradoxical South Atlantic ozone maxima, *Geophys. Res. Letters*, *in press*, 2004.

Freitas, Saulo R., Karla M. Longo, Maria A. F. Silva Dias, Pedro L. Silva Dias, Robert Chatfield, Elaine Prins, Paulo Artaxo, Monitoring the transport of biomass burning emissions in South America, *Environmental Fluid Mechanics*, *accepted*, 2004.

H. B. Singh, L. J. Salas, R. B. Chatfield, E. Czech, A. Fried, J. Walega, M. J. Evans, B. D. Field, D. J. Jacob, D. Blake, B. Heikes, R. Talbot, G. Sachse, J. H. Crawford, M. A. Avery, S. Sandholm, H. Fuelberg, Analysis of the atmospheric distribution, sources, and sinks of oxygenated volatile organic chemicals (OVOC) based on measurements over the Pacific during TRACE-P, *J. Geophys. Res.*, *in press*, 2004.

Chatfield R. B., Z. Guo, G. W. Sachse, D. R. Blake, and N. J. Blake, The subtropical global plume in the Pacific Exploratory Mission-Tropics A (PEM-Tropics A), PEM-Tropics B, and the Global Atmospheric Sampling Program (GASP): How tropical emissions affect the remote Pacific, *J. Geophys. Res.*, *107* (D16), doi:10.1029/2001JD000497, 2002.

Folkins, I., and R.B. Chatfield, Impact of acetone on ozone production and OH in the upper troposphere at high NO_x, *J. Geophys. Res.*, *105*, 11,585–11,599, 2000.

- Chatfield, R.B., Z. Guo, Y. Kondo, L. Jaeglé, N. Blake, D. Blake, G. Gregory, Attributing sources for NO_x observed in the Atlantic free troposphere during the SONEX period: Models and observations emphasize effects of aircraft, *submitted to J. Geophysical Res.*, 2000.
- Rasch P.J., ... , R. B. Chatfield, ... , An assessment of scavenging and deposition processes in global models: Results from the WCRP Cambridge Workshop of 1995, *Tellus*, *in press*, 2000.
- Faloona, I, D. Tan, W.H. Brune, L. Jaeglé, D. J. Jacob, Y. Kondo, M. Koike, R. Chatfield, R. Poeschel, G. Ferry, G. Sachse, S. Vey, B. Anderson, J. Hannon, and H. Fuelberg,, Observations of HO_x and its relationship with NO_x in the upper troposphere during SONEX, 3771–3784, 2000.
- Pougatchev, N.S., G.W. Sachse, H.E. Fuelberg, C.P. Rinsland, R.B. Chatfield, V.S. Connors, N.B. Jones, J. Notholt, P.C. Novelli, and H.G. Reichle, Jr., PEM-Tropics carbon monoxide measurements in historical context, *J. Geophysical Res.*, *104*, 26,195–26,208 1999.
- Chatfield, R.B., J.A. Vastano, L. Li, G.W. Sachse, and V.S. Connors, The Great African Plume from biomass burning: A three-dimensional study of TRACE-A carbon monoxide, in *J. Geophysical Res.*, *103*, 28,059–28,077, 1998.
- Folkins, I., R.B. Chatfield, H. Singh, Y. Chen, and B. Heikes, Ozone production efficiencies of acetone and peroxides in the upper troposphere, *Geophys. Res. Lett.*, *25*, 1305–1308, 1998.
- Folkins, I, R.B. Chatfield, D. Baumgardner and M. Proffitt, Biomass burning and deep convection in Indonesia: results from Ashoe/Mesa, *J. Geophys. Res.*, *102*, 13,291–13,299, 1997.
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- Olson, J., M. Prather, T. Berntsen, G. Carmichael, R. Chatfield, P. Connell, R. Derwent, L. Horowitz, S. Jin, M. Kanakidou, P. Kasibhatla, R. Kotomarthi, M. Kuhn, K. Law, S. Sillman, J. Penner, L. Perliski, F. Stordal, A. Thompson and O. Wild, Results from the IPCC photochemical model intercomparison (PhotoComp), *J. Geophysical Res.*, *102*, 5979–5991, 1997.
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- Brasseur, G. and R. B. Chatfield, The fate of biogenic trace gases in the atmosphere, *Trace Gas Emissions from Plants*, eds., T. Sharkey, E. Holland, H. Mooney, Academic Press, 1991.
- Chatfield, R.B., Ephemeral Biogenic emissions and the earth's radiative and oxidative environment, in *Scientists on Gaia*, MIT Press, ed. Stephen Schneider, 1991
- Chatfield, R.B., and A. C. Delany, Convection links biomass burning to increased tropical ozone: However, models will tend to overpredict O_3 , *J. Geophysical Res*, **95**, 18473–18488, 1990.
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- Chatfield, R.B., and P. J. Crutzen, Are there interactions of iodine and sulfur species in marine air photochemistry?, *J. Geophysical Res*, **95**, 22319–22341, 1990.
- Chatfield, R.B., How lightning and human activity determine tropical ozone levels, in *Ozone in the Atmosphere*, eds., R.D Bojkov and P. Fabian, A. Deepak, 572–575, 1989.
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- Solberg, S., R.B. Chatfield, and I.S.A. Isaksen, Design of a channel model to assess mid-latitude pollution effects including increase of tropospheric ozone, in *Ozone in the Atmosphere*, eds., R.D Bojkov and P. Fabian, A. Deepak, 1989.

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- Chatfield, R.B. and R.A. Brost, A two-stream model of the vertical transport of trace species in the convective boundary layer, *J. Geophys. Res.*, **92**, 13,263–13,276, 1987.
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- Chatfield, R.B., and H. Harrison, Tropospheric ozone, II: Variations along a meridional band, *J. Geophys. Res.*, **82**, 5969–5976, 1977.
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Undergraduate Textbook Contributions

- Chatfield, R.B., “Atmospheric Composition and Structure,” *Earth System Science: Processes and Issues*, ed., G. Ernst, Cambridge University Press, 2000.
- Chatfield, R.B., “Atmospheric Motions and the Greenhouse Effect,” *Earth System Science: Processes and Issues*, ed., G. Ernst, Cambridge University Press, 2000.
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Significant Reports, Theses and Semi-Reviewed Work

- Acid Deposition Modeling Project, Development of Acid Deposition Models: “Clouds” and “Model Resolution”, with A. Thompson and H.–M. Hsu, in Regional Acid Deposition: Models and Physical Processes, NCAR Technical Note NCAR/TN-214+STR, 1983.
- Chatfield, R.B., Remote tropospheric SO₂: Cloud transport of reactive sulfur emissions, Ph.D. dissertation, Colorado State University, published as Cooperative Thesis No. 70, National Center for Atmospheric Research, Boulder, CO 80307, U.S.A., 1982.
- Rasmussen, R.A., R.B. Chatfield, and M.W. Holdren, Hydrocarbon and oxidant chemistries observed at a site near St. Louis, Final Report to the EPA, No. 68–02–2254, 1976.
- Rasmussen, R.A., R.B. Chatfield, and M.W. Holdren, Hydrocarbon levels observed in a midwest rural open–forested area, report to the Coordinating Research Council, Contract CAPRAC–11, 1976.
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